EXC-4000VME
EXC-4000VXI

Test and Simulation Carrier Board for VME/VXI Systems

User's Manual

EXCALIBUR
EXCALIBUR SYSTEMS

311 Meacham Avenue ◆ Elmont ◆ NY 11003 ◆ Tel. (516) 327-0000 ◆ Fax (516) 327-4645
e-mail: excalibur@mil-1553.com website: www.mil-1553.com

Table of Contents

Figures

Tables

1 Introduction

This *User's Manual* supports both the *EXC-4000VME* and the *EXC-4000VXI* carrier boards. Unless otherwise indicated all references to the *EXC-4000VME* apply also to the *EXC-4000VXI* board. For mechanical and electrical differences between the EXC-4000VME and EXC-4000VXI boards, see **Chapter 4 Mechanical and Electrical Specifications.**

1.1 Overview

The *EXC-4000VME* is a multimode, multiprotocol VME/VXI interface carrier board for avionics test and simulation applications. Each board can hold up to eight independent modules where each module can be any one of the following types:

M4K1553P*x*II	Based on our 1553Px family. This module operates as a Bus Controller, up to 32 Remote Terminals and as a Bus Monitor. Supports an Internal Concurrent Monitor in RT and BC/RT modes.
M4K1553PM*x*	Same as above
M4K1553P*x*II-1760	Same as **M4K1553P*xII*** plus MIL-STD-1760 options
M4K1553PM*x*-1760	Same as above
M4K1553MCH	Based on our 1553MCH family. This module is qualified for airborne applications.
M4K429RT*x*	Based on our ARINC 429RxTx board. This module supports either five or ten ARINC 429 channels each of which can be configured in real time as a receive or transmit channel.
M4KDiscrete	This module supports 15 input and 5 open collector output discretes. The module supports TTL (0 to 5 volts) or avionics (0 to 32 volts) voltage levels.
M4KSerial	This module supports up to 4 independent channels of serial communications, each of which can be selected as RS485, RS422 or RS232.
M4KH009	This double size module supports a fully functional H009 channel (CCC, multi-PU, MON) and a concurrent Bus Monitor.
M4KCAN	This module supports up to 6 independent channels of CAN 2.0B protocol with standard and extended message frames and message identifiers.
M4K708	This module supports two channels of ARINC 708/453, each one selectable as either transmit or receive
M4KMMSI	Up to 8 channels EBR -1553 (10 Mbps 1553 protocol using RS-485 transceiver) and 1 monitor output
M4K561	ARINC 561/568/582 6-wire, 1 transmit and 1 receive channel with Standard and Extended Message Frames and Identifiers.

Excalibur will be adding modules to those listed above, increasing the *EXC-4000VME*'s flexibility even further.

Users may choose to populate the board with different types of modules or with multiple modules of the same type. For example, populating the board with four M4K429RT10 modules will give you *forty* ARINC 429 programmable channels.

All modules come with Windows 9*x*/NT/2000/XP drivers, including source code.

EXC-4000VME and VXI Board Features

General Specifications

EXC-4000VME	B size board	
EXC-4000VXI	C size board	
Supports up to 8 modules		
Protocols supported:	ARINC-429/575 (10 channels per module)	
	MIL-STD-1553 (P*x* and MCH compatible)	
	MIL-STD-1760	
	Discrete I/O	
	Serial - RS485/RS422/RS232	
	ARINC 561/568/582	
	H009	708
	CAN	MMSI

Operating Environment

Temperature:	0° - 70°C standard temp.
	-40° - 85°C extended temp.
Humidity:	5% - 90% non-condensing

Physical Characteristics

	VME board	VXI board	
Dimension	160mm×233.35 mm	340mm × 233.35 mm	
Weight	305 g*	1.045K g*	[* without modules]

[**Optional** Rear I/O for EXC-4000VME]

Host Interface

VME/VXI Compliance	Slave: Address - A16 & A24/A32
	Data - D08 (EO), D16
	Interrupts - D16/D08, ROAK
Memory space occupied:	1024 Kbytes @ A24/A32 (128K per module)
	64 bytes @ A16
Power	Depends on configuration

Software Support

C Drivers with source code
Mystic Windows for 429 modules
Merlin+ Windows for P*x* modules
Merlin Windows for MCH modules
Exalt: Excalibur's multiprotocol databus monitoring and analyzing application
ExaltPlus: *Exalt* with bus activity Simulation capabilities

For exact part numbers, see **Chapter 5 Ordering Information**.

EXC-4000VME Block Diagram

The *EXC-4000VME* provides two 96-pin connectors (J1 and J2) for all the I/O connections. The connector's mating part is compromised of four separate 24-pin terminal sticks, each dedicated to its module's I/O connections. The terminal stick's pin assignments are completely defined on the module level. An additional 8-pin connector (J3) is provided for the external signals.

The *EXC-4000VME* contains an 8-contact Dip Switch (SW1) which provides the board's VXI 'Logical Address'.

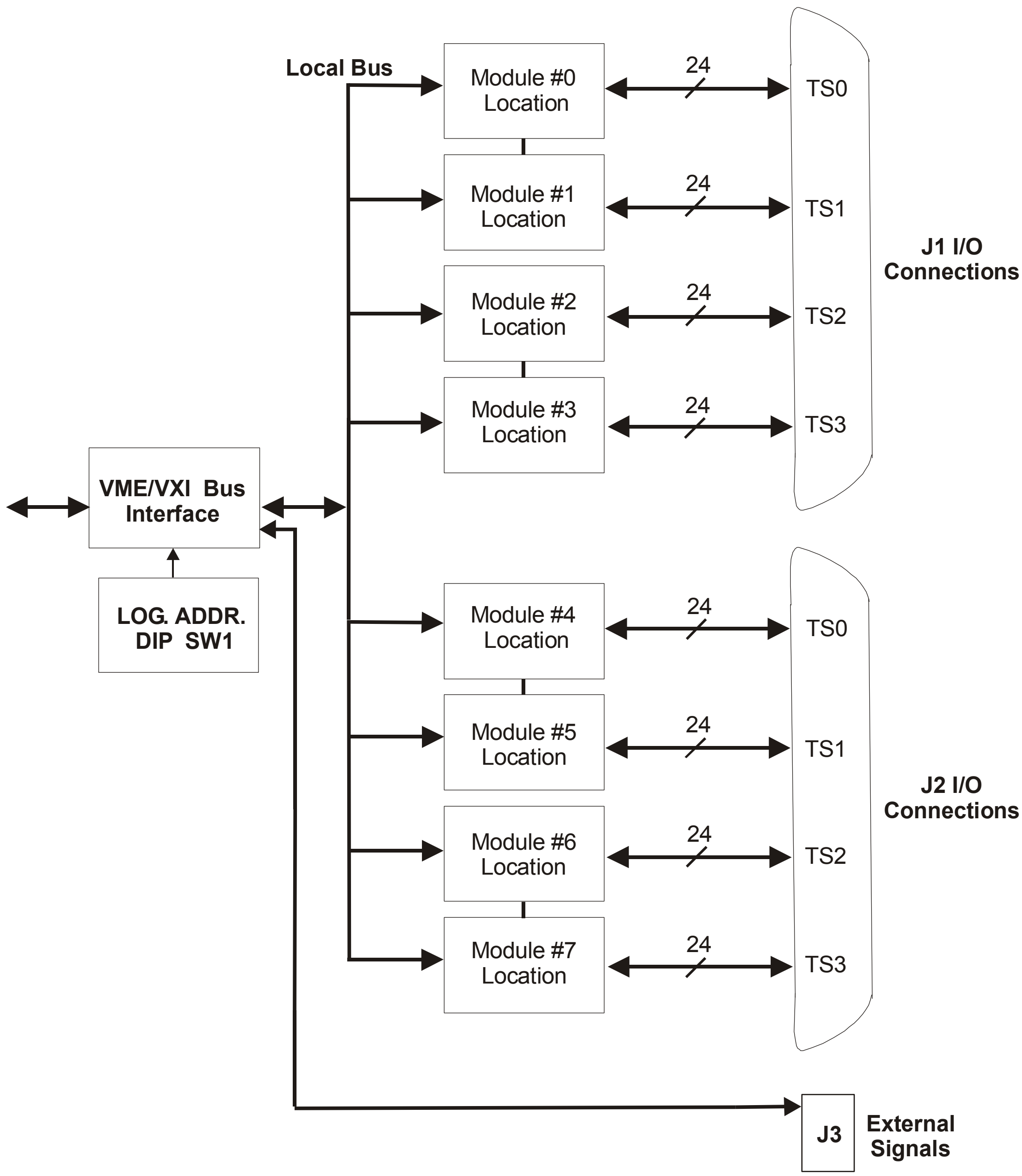


Figure 1-1 ***EXC-4000VME*** **Block Diagram**

1.2 Installation

To operate the *EXC-4000VME* carrier board:

1. Install the board in the computer
2. Add the Excalibur *Software Tools* to the hard disk

1.2.1 Installing the Board

Warning Wear a suitably grounded electrostatic discharge wrist strap whenever handling the Excalibur board and use all necessary antistatic precautionary measures.

To install the *EXC-4000VME*:

1. Before installing the board it is very important to determine which 64 byte section of A16 address space is available for the board's VME/VXI Configuration Registers. After determining this, set the SW1 DIP switch accordingly (See section **4.3 DIP Switches** on page 4-6).
2. Decide if A24 or A32 address space is to be used and set the jumper JP1 accordingly (See section **4.4 Jumpers** on page 4-7).

Note: The board base address in A24 or A32 address space is set via the Offset Register. (See **VXI Offset Register** on page 2-9).

3. Install and set up each module individually, as described in the module's *User's Manual.*
4. **Make certain the computer power source is disconnected.** Insert the *EXC-4000VME* board into the VME/VXI chassis.
5. Attach the user-constructed bus cable to the board and to the bus. The cable may be connected to and disconnected from the board while power to the computer is turned on, but not while the board is transmitting over the bus.

1.2.2 Adding Excalibur Software Tools

The standard software included with the *EXC-4000VME* carrier board is for Windows operating systems. Software compatible with other operating systems is available and can be downloaded from our website: www.mil-1553.com.

To add Excalibur software tools drivers see the **`readme.pdf`** file on the software diskette or CD that came with your specific module.

2 VME/VXI Interface

Chapter 2 describes the VXI interface. The following topics are covered:

2.1 VME/VXI Interface

The *EXC-4000VME* complies with the following VME/VXI parameters:

VME Parameters

Board type:	Slave
Addressing:	A16 and A24/A32
Data:	D16, D8, (EO)
Interrupts:	IRQ 1-7*; D16/D08; ROAK

VXI Parameters

Device Class:	Register based
Manufacturer ID:	3924dec (F45 H)
Address Space:	A16/A24 or A16/A32
Required memory:	1024K; m=0011 (A24)/1011 (A32)
Model code:	4000dec (FA0 H)

The board interfaces to the computer via a 16-bit data bus which can be accessed in bytes or words. The board may be accessed by using address in the form:

For accessing VME/VXI configuration registers:
XXXX (H) (A16 mode) with address modifier codes: 29,2D

For accessing 1553 storage area and configuration registers:
XX XXXX (H) (A24 mode) with address modifier codes: 39, 3A, 3D, 3E
or
XXXX XXXX (H) (A32mode) with address modifier codes: 09, 0A, 0D, 0E

2.2 General Memory Map

The board's memory map is divided into two memory regions:

- **Region 1** (64 bytes) is assigned for the VXI Configuration configuration registers including the board global registers, and
- **Region 2** (1024 Kbytes) is assigned for module memory space.

Address Space	Address	Region	Region Assignment
A16	0000 – 003F H	64 bytes	VXI Configuration Registers (including Board Global Registers)
A24/A32	00000 – FFFFF H	1024 Kbytes	Modules Memory Space

Figure 2-1 General Memory Map

2.3 VME/VXI Configuration Registers

The VME/VXI configuration registers are located within a 64 byte block in the A16 address space between the addresses 49152 (dec) and 65472 (dec). The base address of the configuration registers is determined by the following equation:

Base Address (dec) = V*64 + 49152 (dec)

V, the Logical address of the board, is an integer which varies between 0 and 255 and which the user defines via the 8-pole DIP switch, see section **4.3.1 Board Logical Address DIP Switch Settings** on page 4-6.

To ensure that the board operates within your system, the configuration registers must be re-initialized after power-up or after assertion of SYSRESET*. For a full explanation of the VME/VXI configuration registers and other topics relating to the operation of the VXI bus, see the VXI Bus system Specification.

2.4 VME/VXI Configuration / Board Global Registers

The VME/VXI Configuration/Board global registers reside within the VME A16 memory space (see **Figure 2-1: General Memory Map**).

VXI / Board Global	Register Assignment	
VXI	ID Register	LA + 00 H
	Device Type Register	LA + 02 H
	Control/Status Register	LA + 04 H
	Offset Register	LA + 06 H
	Reserved	LA + 08 – LA + 1FH
	Vector Register	LA + 20 H
	Reserved	LA + 22 H – LA + 26 H
Global	Board ID Register	LA + 28 H
	Software Reset Register	LA + 2A H
	Interrupt Status Register	LA + 2C H
	Time Tag Clock Select Register	LA + 2E H
	Module 0 Info Register	LA + 30 H
	Module 1 Info Register	LA + 32 H
	Module 2 Info Register	LA + 34 H
	Module 3 Info Register	LA + 36 H
	Module 4 Info Register	LA + 38 H
	Module 5 Info Register	LA + 3A H
	Module 6 Info Register	LA + 3C H
	Module 7 Info Register	LA + 3E H

Figure 2-2 VME/VXI Configuration / Board Global Registers Block Map

2.4.1 VXI ID Register

Address: LA + 00 (H)
Read only

The contents of this 16-bit register provides information about the board's configuration, as described below.

Bit	Bit Name	Description
14-15	Device Class: Register Based	Bit 15 '1' Bit 14 '1'
12-13	Address Space	Bit 13 '0' Bit 12 '0' A24 (JP1 Shorted)
		Bit 13 '0' Bit 12 '1' A32 (JP1 Open)
00-11	Manufacturer ID	Set to F54 H / 3924 Dec

ID Register

Note: The VXI specification requires all VXI devices to identify themselves via an ID register.

2.4.2 VXI Device Type Register

Address: LA + 02 (H)
Read only

This 16-bit register contains a fixed Device Type Identifier as well as a 4-bit field which reflects the Required Memory Usage of the carrier board.

Bit	Bit Name	Description
12-15	Required Memory	3 H = 1024 KB for A24 (JP1 Shorted) B H = 1024 KB for A32 (JP1 Open)
00-11	Model code	Set to FA0 H [4000 Dec]

VXI Device Type Register

Note: The VXI specifications require the user to let the system know how much memory the device requires. This is known as the 'm' value in VXI parlance.

2.4.3 VXI Status Register

Address: **LA + 04 (H)**
Read only

A read of the 16-bit register provides the information defined below.

Bit	Bit Name	Description
15	Memory Enable	The state of the Memory Enable bit in the Control Register
14	MODID*	The state of the inverted value of the board's VXI MODID line (connector P2 pin A30 and JP2 Shorted)
07-13	CB0–6	The state of the CB0–6 bits in the Control Register
06	IRQSEL2	The state of the IRQSEL2 bit in the Control Register
05	IRQSEL1	The state of the IRQSEL1 bit in the Control Register
04	IRQSEL0	The state of the IRQSEL0 bit in the Control Register
03	Ready	1 The power-up sequence was completed and the board is ready to accept commands. This bit is a logical "AND" of all installed modules' Ready bit.
02	Passed	Upon power-up: 1 The self-test was successfully completed 0 The carrier board is either executing or has failed its self-test Upon software reset: 1 During self-test 0 The carrier board failed its self-test
01	Sysfail Inhibit	The state of the Sysfail Inhibit bit in the Control Register
00	Reset	The State of the Reset bit in the Control Register

VXI Status Register

2.4.4 VXI Control Register

Address: LA + 04 (H)
Write only

Writing to this 16-bit register causes the board to execute the actions listed below. This register is initialized to 0000 H at power-up (SYSRESET*).

Bit	Bit Name	Description
15	Memory Enable	1 Enables access to the board's Storage Area and Control Registers residing in A24 or A32 VME address space. 0 None of the on board registers and memory which are resident in the A24 or A32 address spaces may be accessed. The Configuration registers, of course remain accessible regardless of the state of this bit, as they reside in the A16 address space of the board.
07-14	CB0–7	Configuration bits – Reserved
04-06	IRQSEL0-2	Writing to these bits selects which one of the VME bus Interrupt Request lines IRQ1* – IRQ7* will be driven active when the board generates an interrupt. 0 H = None 1 H = IRQ1* 2 H = IRQ2* 3 H = IRQ3* 4 H = IRQ4* 5 H = IRQ5* 6 H = IRQ6* 7 H = IRQ7*
03	Reserved	set to 0
02	VECTWREN	Writing a '1' to this bit enables modifying the low byte value of the VXI Vector register. See **VXI Vector Register,** page 2-10
01	Sysfail Inhibit	Reserved - set to 0
00	Reset	Writing a 1 to this bit forces the board into the RESET state. You must not write a 0 into this bit for at least 100 μsec. after writing a 1 into it. That is, once in the RESET state, the board must remain in this state for at least 100 μsec. While in the RESET state the board is completely inactive and will not respond to any commands. Upon releasing the board from the RESET state (write 0 to this bit), the board will perform its self test routines. Each board's module may also be reset via the Global Software Reset Register defined in this manual. This second method is the preferred mechanism for resetting the board.

VXI Control Register

2.4.5 Using Interrupts

The interrupt generated on the selected IRQ* line is the logical OR of the interrupt output from each of the eight modules on the board. An interrupt which was generated by one of the modules, will result in the interrupt routine whose vector resides in VXI Vector register to be executed. The board will place the value (VME STATUS/ID) stored in the VXI Vector register, onto the VME data lines when issuing the interrupt acknowledge cycle. Your processor will use this value to determine which entry in your interrupt vector table to jump to. Within this interrupt routine the actual cause of the interrupt can be determined by polling the appropriate Global Interrupt register.

The interrupt request is cleared automatically at the end of the interrupt acknowledge cycle. This method is referred to in the VME specification as ROAK (Release On Acknowledge). In case of multiple pending interrupt requests the highest priority request will be cleared. After the user services this request a second interrupt will be generated for the next pending interrupt. The priorities are defined in **Table 2-1: Module Request Interrupt Priority**.

Request Name	Priority
Module 0 request	Highest
Module 1 request	
Module 2 request	
Module 3 request	
Module 4 request	
Module 5 request	
Module 6 request	
Module 7 request	Lowest

Table 2-1 Module Request Interrupt Priority

2.4.6 VXI Offset Register

Address: LA + 06 (H)
Write / Read

This 16 bit read/write register defines the base address of the board's A24 or A32 memory and registers.

If A24 addressing is used, the 4 most significant bits of the register are the values of the 4 most significant bits of the board's module memory space addresses and the 12 least significant bits of the register are not used.

If A32 addressing is used, the Offset register represents the 12 most significant bits of the board's module memory space addresses. Thus, Offset register bits 15 through 12 map to the address lines A23 through A20 for the A24 Address Space, and Offset register bits 15 through 04 map to address lines A31 through A20 for the A32 Address Space.

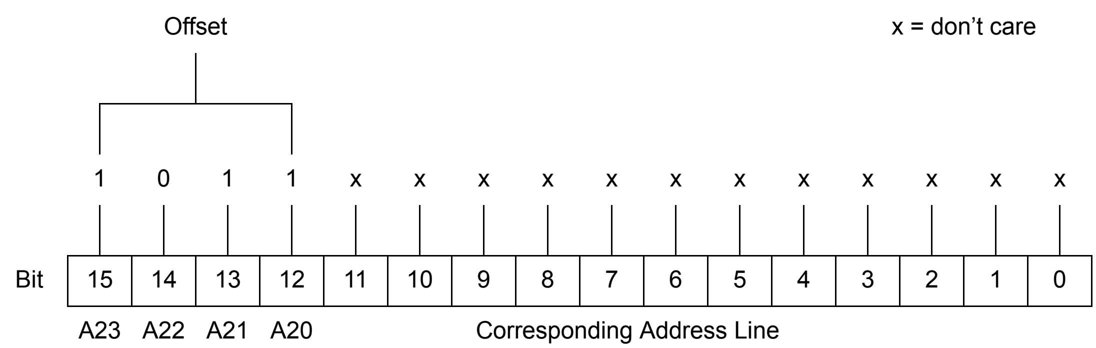
	A24 Mode		**A32 Mode**
Bit	**Description**	**Bit**	**Description**
12-15	Offset value Base Select [23 ... 20]	**04-15**	Offset value Base Select [31 ... 20]
00-11	Reserved [don't care]	**00-03**	Reserved [don't care]

VXI Offset Register

A24 Address Example

Required base address = B00000 H

Write B*xxx* H to Offset Register



A32 Address Example

Required base address = 6780 0000 H

Write 678*x* H to Offset Register

Offset (bits 15–4)   x = don't care

	0	1	1	0	0	1	1	1	1	0	0	0	x	x	x	x
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Corresponding Address Line	A31	A30	A29	A28	A27	A26	A25	A24	A23	A22	A21	A20				

2.4.7 VXI Vector Register

Address: LA + 20 (H)
Write / Read

In the case of an interrupt generated by the board, the bits of this 16-bit register, known as the STATUS/ID, are used as the interrupt vector during the ensuing interrupt acknowledge cycle. The board is a D16/D08 INTERRUPTER, and as a result will place these bits on lines D00-15/D00-07 of the VME bus during the interrupt acknowledge cycle.

Bit	Description
08-15	Vector Hi byte Value
00-07	Vector Lo byte value

VXI Vector Register – Write Operation

Bit	Description
08-15	Vector Hi byte Value (defaults to FF H at power up)
00-07	*Either* Logical Address (SW1 contacts state) if VECTWREN bit = 0 *or* Vector Lo byte value (defaults to SW1 state at power-up) if VECTWREN = 1

VXI Vector Register – Read or Interrupt Acknowledge Operation

2.4.8 Global Board ID Register

Address: LA + 28 (H)
Read only

The Global Board ID Register comprises three identification items:

Bit	Bit Name	Description
08-15	Board ID	Hard coded to value 40 H
04-07	FPGA Rev	1 = Rev 1 2 = Rev 2 3 = Rev 3
00-03	Reserved	Hard coded to 0 H

Global Board ID Register

2.4.9 Global Software Reset Register

Address: LA + 2A (H)
Write

The Global Software Reset Register performs reset operations of the modules. Individual modules may be reset.

Bit 08, the Global Time Tag Reset, resets all the modules Time Tag counters.

Bit	Bit Name	Description
09-15	Reserved	
08	Global Time Tag Reset	Resets all the modules Time Tag counters 1 = Reset all time Tag counter 0 - No effect
07	Module 7 Software reset	1 = Reset module 0 = No effect
06	Module 6 Software reset	1 = Reset module 0 = No effect
05	Module 5 Software reset	1 = Reset module 0 = No effect
04	Module 4 Software reset	1 = Reset module 0 = No effect
03	Module 3 Software reset	1 = Reset module 0 = No effect
02	Module 2 Software reset	1 = Reset module 0 = No effect
01	Module 1 Software reset	1 = Reset module 0 = No effect
00	Module 0 Software reset	1 = Reset module 0 = No effect

Global Software Reset Register

2.4.10 Global Interrupt Status Register

Address: LA + 2C (H)
Write / Read

The Global Interrupt Status Register indicates which modules are currently interrupting. Each Status bit can be cleared individually by writing ‘1’ to it.

		Description	
Bit	**Bit Name**	**Read**	**Write**
08-15	Reserved	Set to 0	Set to 0
07	Module 7 Interrupt Status	1 = Interrupt 0 = No Interrupt	1 = Clear Status Bit 0 = No effect
06	Module 6 Interrupt Status	1 = Interrupt 0 = No Interrupt	1 = Clear Status Bit 0 = No effect
05	Module 5 Interrupt Status	1 = Interrupt 0 = No Interrupt	1 = Clear Status Bit 0 = No effect
04	Module 4 Interrupt Status	1 = Interrupt 0 = No Interrupt	1 = Clear Status Bit 0 = No effect
03	Module 3 Interrupt Status	1 = Interrupt 0 = No Interrupt	1 = Clear Status Bit 0 = No effect
02	Module 2 Interrupt Status	1 = Interrupt 0 = No Interrupt	1 = Clear Status Bit 0 = No effect
01	Module 1 Interrupt Status	1 = Interrupt 0 = No Interrupt	1 = Clear Status Bit 0 = No effect
00	Module 0 Interrupt Status	1 = Interrupt 0 = No Interrupt	1 = Clear Status Bit 0 = No effect

Global Interrupt Status Register

2.4.11 Global Time Tag Clock Select Register

Address: LA + 2E (H)
Write / Read

The Global Time Tag Clock Select Register is used to set either an internal (1 MHz) or external source for the board’s Global Time Tag Clock. See section **4.5.2.2 External Signals Descriptions [Connector J3]** on page 4-12.

Bit	**Description**		
03-15	Reserved – set to 0		
00-02	Time Tag Clock Select	0 1 - 4 5 6 - 7	Internal source (default) Reserved External source Reserved

Global Time Tag Clock Select Register

2.4.12 Global Module Info Registers

Address: LA + 30...3E (H)
Read only

The Global Module Info Registers provide identification information for each of the eight modules, respectively.

Bit	Description	
12-15	Module ID	0 H = Module 0 Info Register (at LA + 30 H) 1 H = Module 1 Info Register (at LA + 32 H) 2 H = Module 2 Info Register (at LA + 34 H) 3 H = Module 3 Info Register (at LA + 36 H) 4 H = Module 4 Info Register (at LA + 38 H) 5 H = Module 5 Info Register (at LA + 3A H) 6 H = Module 6 Info Register (at LA + 3C H) 7 H = Module 7 Info Register (at LA + 3E H)
05-11	Reserved	set to 0
00-04	Module type	01 H = M4K561 02 H = M4KSerial 03 H = M4K1553MCH 04 H = M4K429RTx 05 H = M4K1553PxII 06 H = M4KMMSI 07 H = M4K708 09 H = M4KH009 0C H = M4KCAN 0D H = M4KDiscrete 1F H = none

Global Module Info Registers

3 Modules Area Overview

3.1 Modules Memory Space

The modules memory space is divided equally between the modules, into eight ranges of 128 Kbytes each.

Range Assignment	Address Range
Module 0 Memory Space	00000 – 1FFFF H
Module 1 Memory Space	20000 – 3FFFF H
Module 2 Memory Space	40000 – 5FFFF H
Module 3 Memory Space	60000 – 7FFFF H
Module 4 Memory Space	80000 –9 FFFF H
Module 5 Memory Space	A0000 – BFFFF H
Module 6 Memory Space	C0000 – DFFFF H
Module 7 Memory Space	E0000 – FFFFF H

Figure 3-1 Modules Memory Space Map

When accessing the modules memory space, we recommend that you use word addressing as is the case with 16-bit control registers. When accessing 8-bit control registers, we recommend that you use byte addressing as there is a possibility of inadvertently overwriting a byte-wide register (which resides next to the desired register) when using 16-bit word addressing.

All 16-bit words contained in the module's dual-port RAM are stored in the following manner:

Byte	Access Address
Hi	Even
Lo	Odd

Example: The module's Stack Pointer is located at address: *xxxx*

Hi Byte	Lo Byte
xxxx	xxxx+1

3.2 Module Location Overview

Each module location complies with the 125-pin Excalibur M4K series size module and is assigned a 128 Kbyte range of the carrier board's A24/A32 memory map.

Each module location provides 5 module identification lines and the following local bus dedicated signals: module reset, module chip select, module interrupt.

All module locations share common address lines, data lines, a read signal, a write signal, a low enable signal, a high enable signal and a busy signal.

Two additional common signals the Time Tag Clock (1 MHz) and the Time Tag Reset are intended for modules with Time Tag synchronization.

Module location pairs 0/1, 2/3, 4/5, and 6/7 share 6 common lines for intermodule interfaces. For example: two M4K1553P*x*II modules can provide the 1553 Concurrent Monitoring feature.

4 Mechanical and Electrical Specifications

Chapter 4 describes the mechanical and electrical specifications of the EXC-4000VME and EXC-4000VXI carrier boards. The topics covered are:

4.1 Board Layout

4.1.1 EXC-4000VME Board Layout

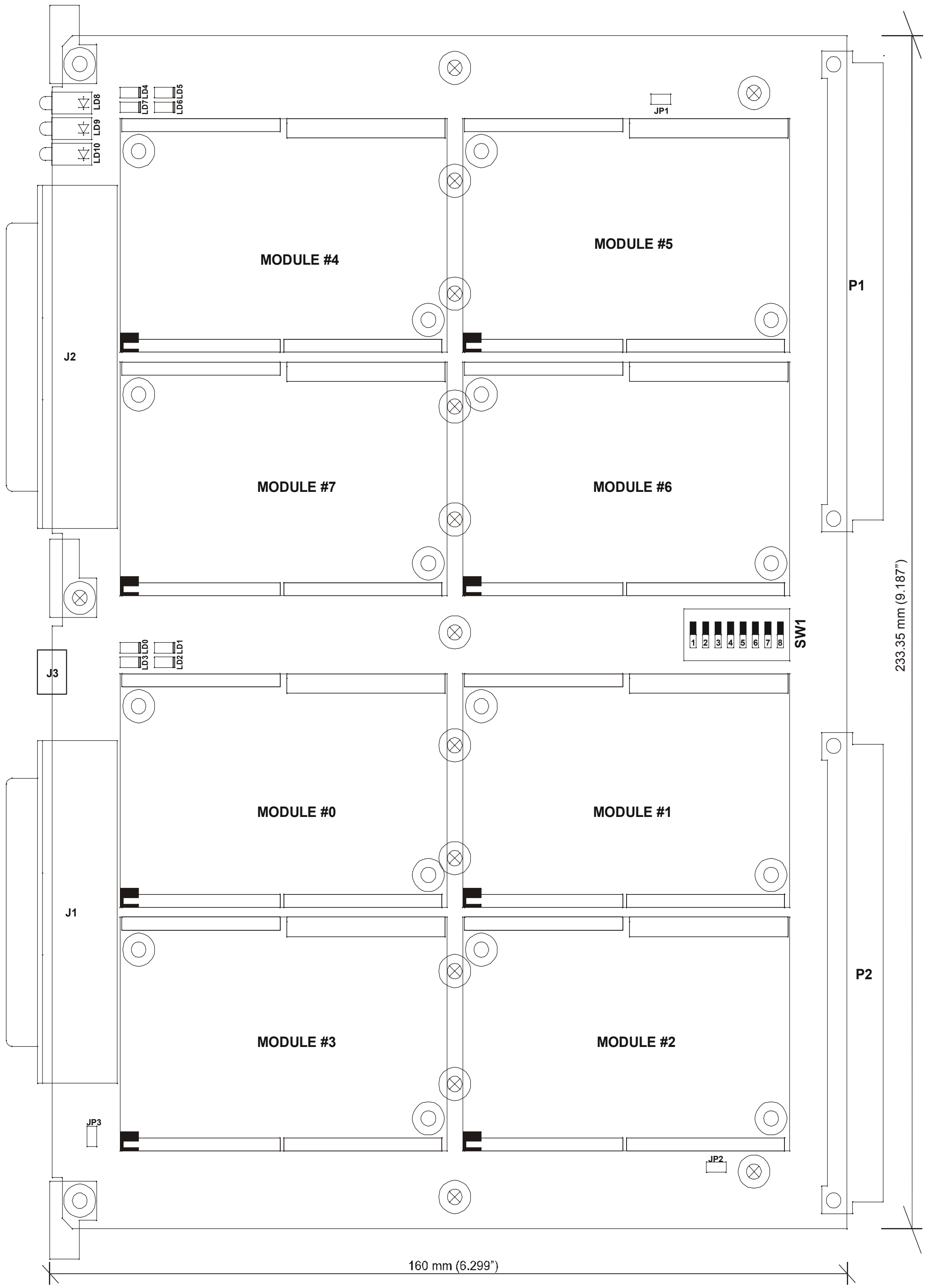


Figure 4-1 EXC-4000VME Board Layout

4.1.2 EXC-4000VXI Board Layout

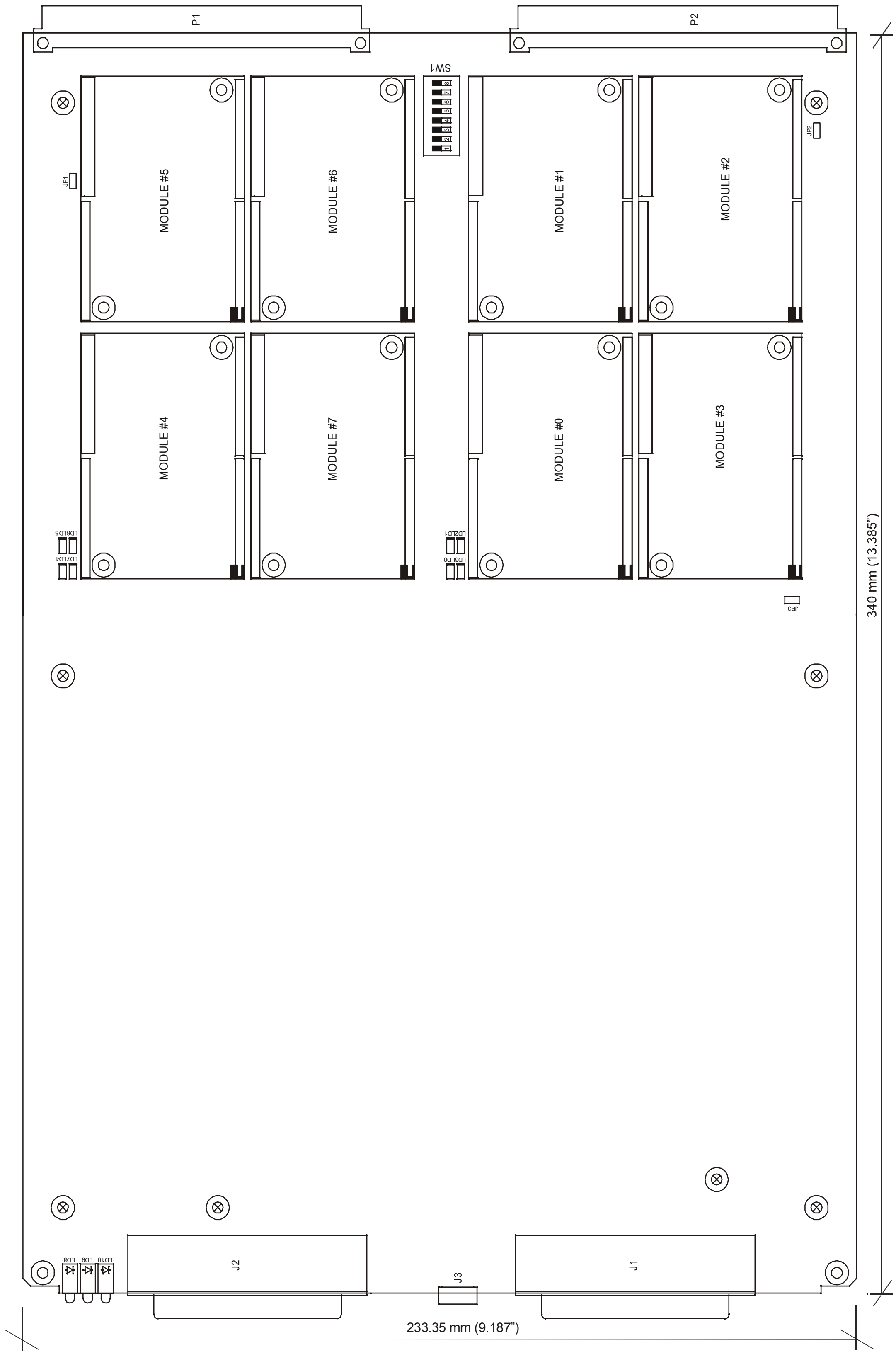
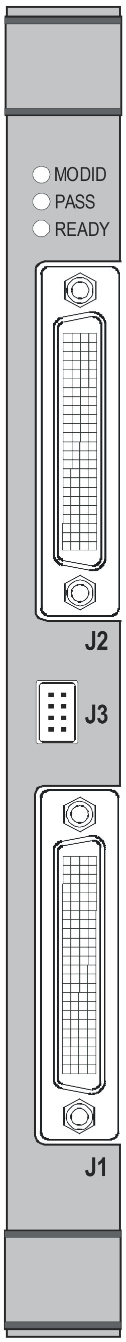


Figure 4-2 EXC-4000VXI Board Layout

4.2 Led Indicators

4.2.1 EXC-4000VME LED Indicators

The MODID, PASS and READY LEDs are general to the operation of the entire board. In addition there are eight PCB surface mounted RDY LEDs, one per each module. The function of each LED is listed below.



LED Name	Indication
MODID	Reflects the state of the MODID pin in the VXI bus. JP2 must be installed) This LED has no function in a VME system
PASS	The board passed the power-on self-test routine. Reflects the state of the same bit in the VXI Configuration Status register.
READY	Indicates that the board is ready for operation. Reflects the state of bit 03 of the VXI Configuration Status register.

Front Panel LEDs

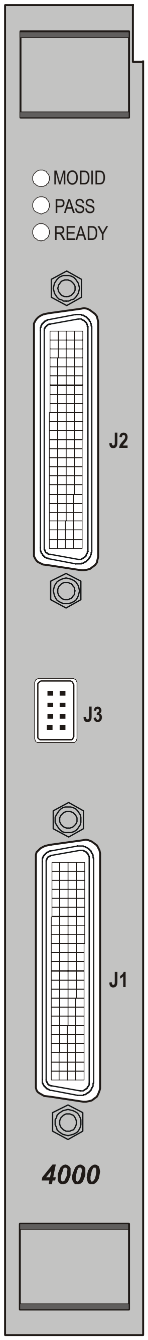
LED	Name	Indication
LD0	RDY0	Module 0 ready
LD1	RDY1	Module 1 ready
LD2	RDY2	Module 2 ready
LD3	RDY3	Module 3 ready
LD4	RDY4	Module 4 ready
LD5	RDY5	Module 5 ready
LD6	RDY6	Module 6 ready
LD7	RDY7	Module 7 ready

PCB Surface Mount LEDs

Figure 4-3 VME Front Panel

4.2.2 EXC-4000VXI LED Indicators

The MODID, PASS and READY LEDs are general to the operation of the entire board. In addition there are eight PCB surface mounted RDY LEDs, one per each module. The function of each LED is listed below.



LED Name	Indication
MODID	Reflects the state of the MODID pin in the VXI bus. JP2 must be installed) This LED has no function in a VME system
PASS	The board passed the power-on self-test routine. Reflects the state of the same bit in the VXI Configuration Status register.
READY	Indicates that the board is ready for operation. Reflects the state of bit 03 of the VXI Configuration Status register.

Front Panel LEDs

LED	Name	Indication
LD0	RDY0	Module 0 ready
LD1	RDY1	Module 1 ready
LD2	RDY2	Module 2 ready
LD3	RDY3	Module 3 ready
LD4	RDY4	Module 4 ready
LD5	RDY5	Module 5 ready
LD6	RDY6	Module 6 ready
LD7	RDY7	Module 7 ready

PCB Surface Mount LEDs

Figure 4-4 VXI Front Panel

4.3 DIP Switches

There is one DIP Switch on the *EXC-4000VME* and *EXC-4000VXI* board which controls the Logical Address of the board. This switch is described below.

4.3.1 Board Logical Address DIP Switch Settings

DIP switch SW1 is used to select the board's Logical Address as described in section **2.4 VME/VXI Configuration / Board Global Registers** on page 2-4. The Logical Address is set as shown below.

Logical Address Switch (SW1)

		MSB							LSB
'1'	'1'	1	2	3	4	5	6	7	8
A15	A14	A13	A12	A11	A10	A9	A8	A7	A6

Note: 1. Numbers indicate switch positions.
2. Address lines A15, A14 are always decoded as "1".

Switch ON or Closed = logic 0 at switch position
Switch OFF or Open = logic 1 at switch position

Example: For a logical address of C0 H (= A16 address F000 H), set position 1 and 2 to OFF or Open and all other switches to ON or Closed.

4.3.2 Factory Default DIP Switch Settings

Following are the factory preset default settings:

SW1	Set to Logical Address 80H (1 OFF, 2-8 ON = A16 address E000 H).

4.4 Jumpers

The jumpers are provided on the board for various user selectable functions. These jumpers are mounted with shorting blocks according to the default board setup. (See section **4.4.3 Factory Default Jumper Settings** on page 4-7). In high vibration environments these jumpers can be soldered or 'wire-wrapped'. Jumpers not appearing on the Board Layout are factory set and should not be used.

4.4.1 VME Address Space Select Jumpers [JP1]

The VME Address Space Select jumper selects the VME Address Space in which the board's memory will be located.

Jumper shorted	A24 address space
Jumper open	A32 address space

4.4.2 VXI MODID Connect Jumper [JP2]

The VXI MODID Connect jumper connects the board to the VXI MODID signal located at P2-A30.

Jumper shorted	MODID connected (ready for VXI environment)
Jumper open	MODID disconnected (pin P2-A30 free for VME user-defined)

4.4.3 Factory Default Jumper Settings

Following are the factory preset default settings for VME:

JP1	Shorted	Set to A24 address space
JP2	Open	Set to MODID disconnected

Following are the factory preset default settings for VXI:

JP1	Shorted	Set to A24 address space
JP2	Shorted	Set to MODID connected

4.5 Connectors

The EXC-4000VME and EXC-4000VXI boards contain the following connectors:

1. Two **96-pin female connectors** (J1 and J2) pass all the modules I/O signals. (P/N: Molex®51-26-0000).

   A Mating connector with 4 terminal sticks and a plastic hood are provided:

Molex ® 51-26-0012	Cable plug
Molex ® 51-25-1012	24-pin Terminal stick

2. Two DIN type 96-pin VME/VXI connectors (P1 and P2).
3. An 8-pin male connector (J3) provides all the external signals.

   P/N Molex ® 87333-0831

   A mating crimp housing and crimp terminals are provided:

P/N Molex ® 51110–0860	Crimp housing
P/N Molex ® 50394–8100	Crimp terminals

4.5.1 Communications I/O Connectors [J1 and J2]

Each 96-pin connector is divided into four rows (or terminal sticks) of 24 pins each. Each Terminal stick is for a specific module location. All the pins with in the specific Terminal Stick are defined by the individual module. See the *User's Manual* for each module

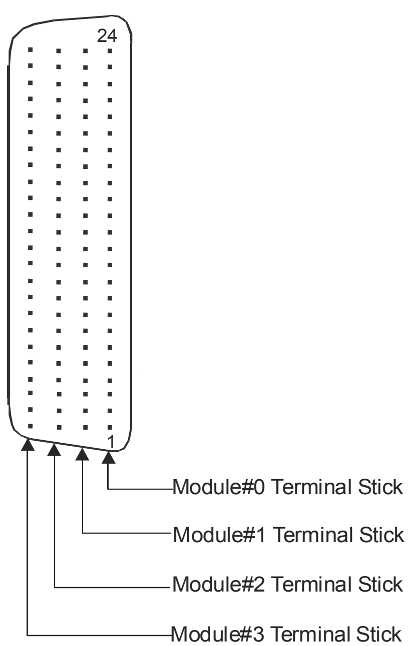


Figure 4-5 J1 Connector Layout Front view

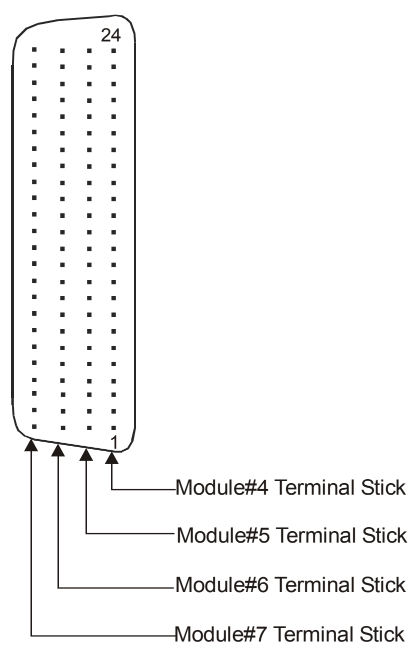


Figure 4-6 J2 Connector Layout Front view

4.5.1.1 VME/VXI Connector P1 Pinout

Pin	Signal	Pin	Signal	Pin	Signal
A1	D00	B1		C1	D08
A2	D01	B2		C2	D09
A3	D02	B3		C3	D10
A4	D03	B4	BG0IN*	C4	D11
A5	D04	B5	BG0OUT*	C5	D12
A6	D05	B6	BG1IN*	C6	D13
A7	D06	B7	BG1OUT*	C7	D14
A8	D07	B8	BG2IN*	C8	D15
A9	GND	B9	BG2OUT*	C9	GND
A10	SYSCLK	B10	BG3IN*	C10	
A11	GND	B11	BG3OUT*	C11	
A12	DS1*	B12		C12	SYSRESET*
A13	DS0*	B13		C13	LWORD*
A14	WRITE*	B14		C14	AM5
A15	GND	B15		C15	A23
A16	DTACK*	B16	AM0	C16	A22
A17	GND	B17	AM1	C17	A21
A18	AS*	B18	AM2	C18	A20
A19	GND	B19	AM3	C19	A19
A20	IACK*	B20	GND	C20	A18
A21	IACKIN*	B21		C21	A17
A22	IACKOUT*	B22		C22	A16
A23	AM4	B23	GND	C23	A15
A24	A07	B24	IRQ7*	C24	A14
A25	A06	B25	IRQ6*	C25	A13
A26	A05	B26	IRQ5*	C26	A12
A27	A04	B27	IRQ4*	C27	A11
A28	A03	B28	IRQ3*	C28	A10
A29	A02	B29	IRQ2*	C29	A09
A30	A01	B30	IRQ1*	C30	A08
A31	-12V	B31		C31	+12V
A32	+5V	B32	+5V	C32	+5V

Table 4-1 Connector P1 Pinout

4.5.1.2 VME/VXI Connector P2 Pinout

Pin	Signal	Pin	Signal	Pin	Signal
A1		B1	+5V	C1	
A2		B2	GND	C2	
A3		B3		C3	
A4		B4	A24	C4	
A5		B5	A25	C5	
A6		B6	A26	C6	
A7		B7	A27	C7	
A8		B8	A28	C8	
A9		B9	A29	C9	
A10		B10	A30	C10	
A11		B11	A31	C11	
A12		B12	GND	C12	
A13		B13	+5V	C13	
A14		B14		C14	
A15		B15		C15	
A16		B16		C16	
A17		B17		C17	
A18		B18		C18	
A19		B19		C19	
A20		B20		C20	
A21		B21		C21	
A22		B22	GND	C22	
A23		B23		C23	
A24		B24		C24	
A25		B25		C25	
A26		B26		C26	
A27		B27		C27	
A28		B28		C28	
A29		B29		C29	
A30	MODID (x)	B30		C30	
A31		B31	GND	C31	
A32		B32	+5V	C32	

Table 4-2 Connector P2 Pinout

Note: (x) = VXI signals. Each of them is unconnected, unless the specific jumper is shorted (see section **4.4 Jumpers** on page 4-7).

4.5.2 VME/VXI Connector J3 Pinout

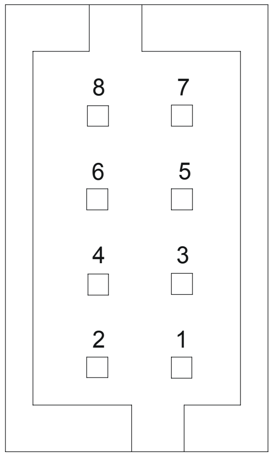


Figure 4-7 Connector J3 Pinout

4.5.2.1 J3 Pinout

Pin	Signal	Pin	SIgnal
8	EXTTRSOn	**7**	SHIELD
6	RESERVED	**5**	RESERVED
4	GND	**3**	EXTTCLKO
2	EXTTRSTn	**1**	EXTTCLKI

Table 4-3 J3 Connector Pinout

4.5.2.2 External Signals Descriptions [Connector J3]

Signal	Description
EXTTCLKI	**External Time Tag Clock Input** (Nominal value: 1MHz). This signal supplies an external global clock for the Time Tags of all the modules. Use the signal to synchronize the Time Tags that are implemented on the modules[a] to other boards or systems.[b] See **Global Time Tag Clock Select Register** on page 2-12.
EXTTCLKO	**Global Time Tag Clock TTL Output** (1 MHz). This signal is the Global Clock that is supplied to all the modules for their Time Tags. Use the signal to synchronize other boards or systems to the Time Tags that are implemented on the modules.[a] The source of this clock is either the External Time Tag Clock EXTTCLKI [b] or the Internal Time Tag Clock. See **Global Time Tag Clock Select Register** on page 2-12
EXTTRSTn	**External Time Tag reset TTL Input**. Use this low active pulsed signal (minimum 100 nsec.wide) to simultaneously reset the Time Tags of all the modules from an external source. Use the signal to synchronize these Time Tags to other boards or systems.[b]
EXTTRSOn	**Global Time Tag Reset TTL Output** This low active signal is activated each time a Global Time Tag Reset is applied. Use the signal to synchronize other boards or systems to the Time Tags that are implemented on the modules.[a] This signal is activated by either the internal Global Time Tag signal (see **Global Software Reset Register** on page 2-11) or from the External Time Tag signal (EXTTRSOn).[b]
GND	Provides ground reference for the digital signal connections.
SHIELD	Provided for a cables shield connection. This signal is connected to the case of the computer through the boards front panel.

Table 4-4 External Signals description [Connector J3]

a. See the manual for each module for a description of how the Time Tag clock is implemented, if used, for that module.

b. **To Synchronize with External Sources**
To synchronize a single *EXC-4000VME* board to an external system, the external clock source and the external reset must be connected to the **EXTTCLKI** and the **EXTTRSTn** signals respectively.

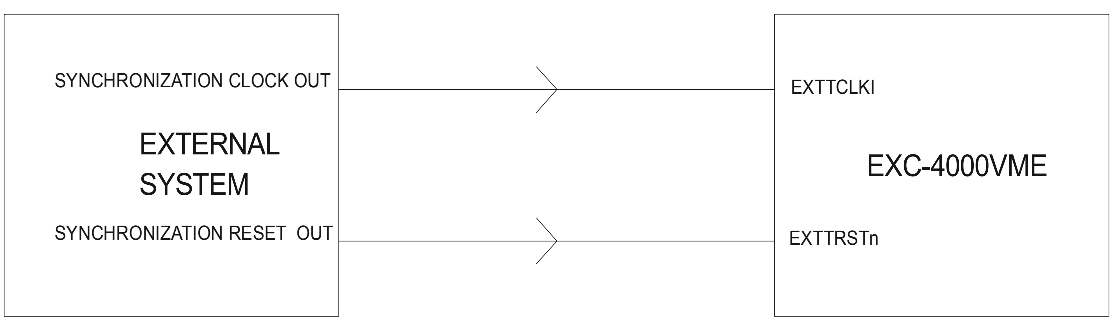


Figure 4-8 Synchronization of a single *EXC-4000VME* board to an external system

To synchronize an external system to a single *EXC-4000VME* board, the EXTTCLKO and the EXTTRSOn signals need to be connected to the external clock source and the external reset respectively.

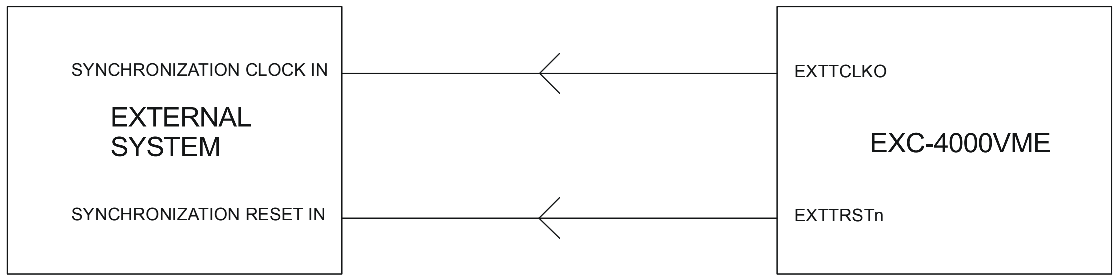


Figure 4-9 Synchronization of an external system to a single *EXC-4000VME* board

Note: The synchronization clock and reset signals may be connected to multiple targets to achieve system wide synchronization.

To Synchronize Between *EXC-4000VME* Boards

To synchronize multiple *EXC-4000VME* boards the **EXTCLKO** and the **EXTRSOn** signals of one board need to be connected to all the **ETTCLKI** and the **EXTTRSTn** signals respectively, of the remaining boards.

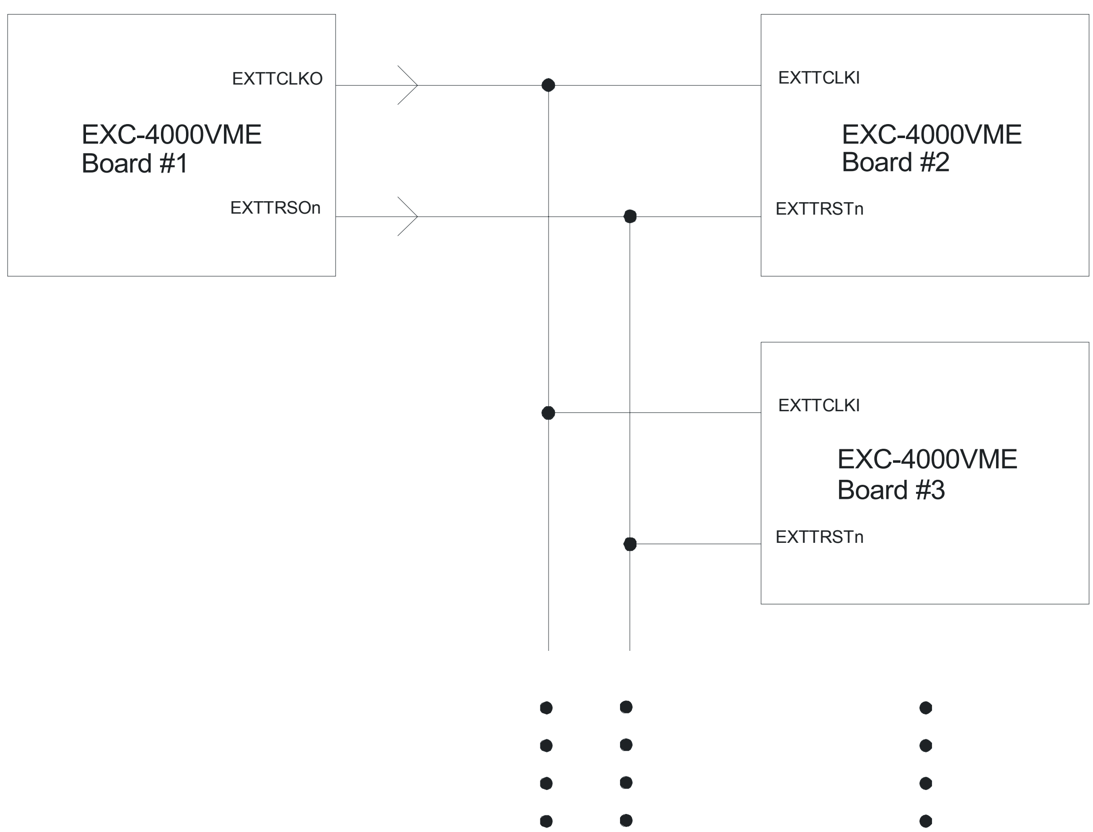


Figure 4-10 Synchronization between *EXC-4000VME* Boards

4.6 Power Requirements

The power requirements for the *EXC-4000VME* and *EXC-4000VXI* without any modules installed are listed in the following table:

	+5V	+12V	–12V
EXC-4000VME	520mA	15mA	15mA
EXC-4000VXI	520mA	15mA	15mA

EXC-4000VME **and** ***EXC-4000VXI*** **Power Requirements**

The final power requirements will depend on how many and which modules are installed. To calculate the exact board power requirements, see the specific module's *User's Manual*.

4.7 EXC-4000VXI Shield

The EXC-4000VXI board comes complete with shield covers. In case Jumper of DIP-Switch settings need to be changed or new modules installed, the shield covers must be disassembled. To disassemble the shield:

1. Remove the six screws holding the upper and lower covers together.
2. Slide out the upper shield cover from under the front panel.
3. Carry out the required modifications.
4. Reassemble the shield covers.

5 Ordering Information

Chapter 5 explains which options to indicate when ordering an *EXC-4000VME* or *EXC-4000VXI* carrier board.

Basic part #

EXC-4000VME/*xx*	Multi-protocol interface for VME compatible systems
EXC-4000VME/*xx*-E	Same as above with extended temperature/ ruggedized version. All the modules come with a ruggedized, extended temperature (-40° to + 85°C) option.
EXC-4000VXI/*xx*	Multi-protocol interface for VXI compatible systems C-size board, complete with shield
EXC-4000VXI/*xx*-E	Same as above with extended temperature/ ruggedized version. All the modules come with a ruggedized, extended temperature (-40° to + 85°C) option.

Note: "*xx*" specifies the modules ordered with the carrier board. At present the following module options are available:

Module Code	Module Part #	Description
A*x*	M4K429RT5	ARINC 429 interface module: supports up to five channels
B*x*	M4K429RT10	ARINC 429 interface module: supports up to ten channels
C*x*	M4K708	The module supports two ARINC 708/453 channels, each one selectable as either transmit or receive
D*x*	M4KH009	Double-size H009 interface module: supports CCC, multi-PU, CCC/ Concurrent PU and Bus monitor modes. Includes Concurrent Bus monitor mode
E*x*	M4K1553MCH	MIL-STD-1553 interface module: supports BC, single RT, RT/ Concurrent-BM and BM modes.
F*x*	M4K1553P*xII*	MIL-STD-1553 interface module: supports BC, multiple RTs, BC/ Concurrent-RT and BM modes. Supports an Internal Concurrent Monitor in RT and BC/RT modes
G*x*	M4K1553PM*x*	Same as M4K1553P*xII*
I*x*	M4KDiscrete	Discrete interface module: supports 15 input and 5 output discretes with TTL (0 – 5V) or Avionic (0 – 32V) levels
J*x*	M4KSerial2	Serial Interface module: supports two independent channels with RS485, RS422 or RS232 communication
K*x*	M4KSerial4	Same as above - supports four independent channels
L*x*	M4K1553P*xII*-1760	MIL-STD-1553 interface module: supports BC, multiple RTs, BC/ Concurrent-RT and BM modes with MIL-STD-1760 option. Supports an Internal Concurrent Monitor in RT and BC/RT modes
M*x*	M4K1553PM*x*-1760	Same as M4K1553P*xII*-1760
O*x*	M4KCAN2	2 independent channels of CAN 2.0 B protocol with standard and extended message frames and message identifiers

Module Code	Module Part #	Description
P*x*	M4KCAN4	Same as above with 4 independent channels
Q*x*	M4KCAN6	Same as above with 6 independent channels
R*x*	M4KMMSI	Mini Munitions Store Interface module. Supports RT, BC/Concurrent-RT/ Concurrent Monitor and Bus Monitor modes. Up to 8 hub ports EBR-1553 [10 Mbps 1553 protocol using RS-485 transceivers] and 1 monitor output.

More modules are in design. Check our website for the latest modules: www.mil-1553.com.

Note:

1. Use the Module part# if ordering separately from the *EXC-4000VME* or *EXC-4000VXI*.
2. The ***x*** following the module code denotes the number of modules per board.

   Example: B2 = 2 × ARINC 429 M4K429RT10 modules

3. When ordering a board with a number of different protocol modules, the module codes must be in the following form:

   EXC-4000VME/AxBxExGx

   The occupation of modules starts from the left, module location 0, to right, module location n. If an empty module location is required, insert an asterisk (*).

   Example: Example: EXC-4000VME/A1F2K1

   This is a EXC-4000VME board with:

   1 M4K429RT5 module at module location 0;
   2 M4K1553P*x*II modules at module location 1 and 2;
   1 M4KSerial4 module at module location 3.

   The *EXC-4000VME*/ *EXC-4000VXI* supports up to 8 modules.

4. The accompanying cable assembly may be order using the same module codes as used in specifying the modules on the board but with the prefix: **X4K-**

   Example: **X4K-A1F2K1** — this is the matching cable for the EXC-4000PCI/A1F2K1 board in the example above.

5. External Loopback test connectors are available for most configurations. Contact Excalibur's technical support for information about these connectors.

The information contained in this document is believed to be accurate. However, no responsibility is assumed by Excalibur Systems, Inc. for its use and no license or rights are granted by implication or otherwise in connection therewith. Specifications are subject to change without notice.

March 2005, Rev A-3